# Health Economics of Undernutrition Among the Elderly

**Kjeld Møller Pedersen**
**University of Southern Denmark**
**Aalborg University**
**kmp@sam.sdu.dk**

# Outline

1. Costs associated with undernourishment
    - How not to do
    - How to do

2. Economic evaluation
    - What it is and data needed
    - Example of costing
    - Example of completed study

# Two health economic issues

1. Costs associated with undernutrition/malnutrition among the elderly

2. Economic evaluation of interventions to cope with undernutrition

# Summary of additional costs

Undernutrition affects mostly older adults,
and

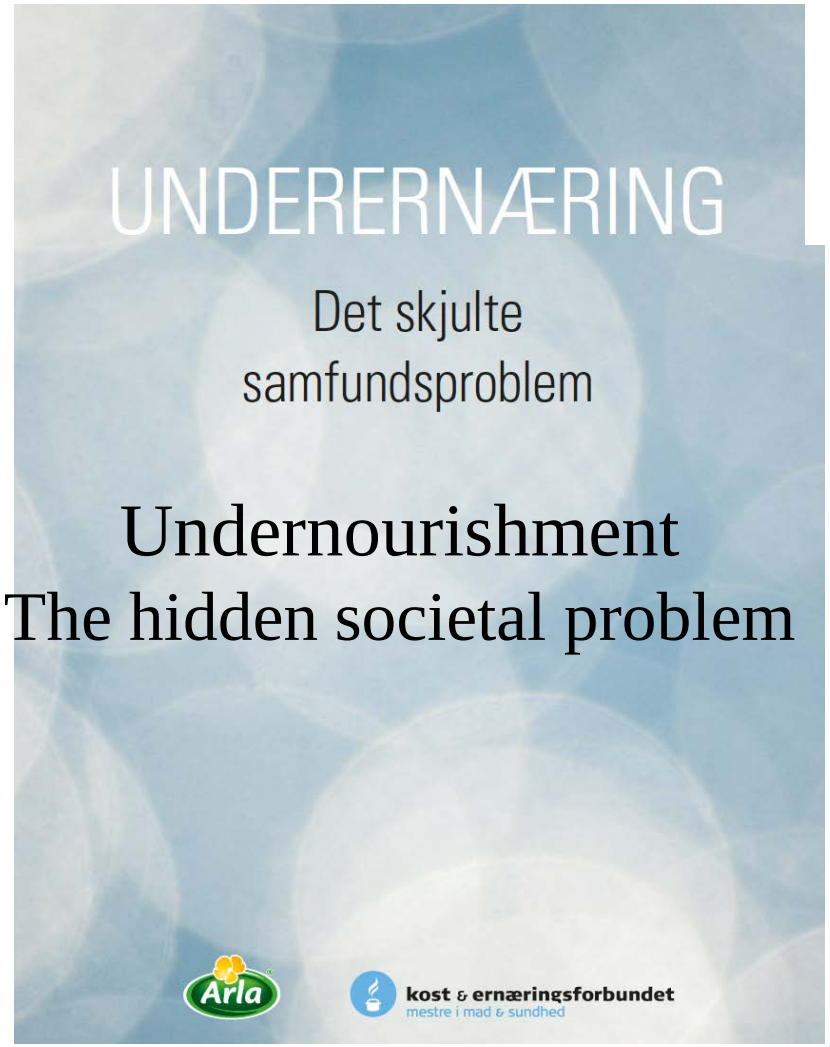
- **affects immune response, with higher rates of infection and delayed wound healing**

- **And leads to an increase in length of hospital stay, hospital readmissions, and an increase in other health costs**

# The ’accepted’ truth:

## Undernourishment costs the Danish society 6 billion DDK (€ 900 million)

**2014**




Undernourishment
The hidden societal problem

8. DE ØKONOMISKE KONSEKVENSER

The economic consequences

Very simple calculations based on a transfer to Denmark Dutch results (2013:The economic costs of disease related malnutrition)

Tabel 3. Kendte udgifter og mulig besparelse. Known expenditures and possible savings

| | | |
|---|---|---|
| Plejehjem og hjemmepleje | Nursing homes | 39 mia. kroner |
| Hospitaler | Hospitals | 78 mia. kroner |
| Totale udgifter | Total expenditures | 117 mia. kroner |
| Merudgifter underernæring*) | 5% of total expenditures | 6 mia. kroner |
| Besparelse ved behandling*) | 25% of the additional costs | 1,5 mia. kroner |

# Be careful

- Difficult to transfer economic results across borders
  - Are unic costs the same?
  - Is clinical practice (reasonable) similar
  - Challenge:  To find comparison group in order to capture added costs of undernourishment

# The way to do it: Propensity-based calculations

## Malnutrition: a marker for increased complications, mortality, and length of stay after total shoulder arthroplasty

J Shoulder Elbow Surg (2016) 25, 193-200

*Propensity-adjusted* multivariable logistic regression demonstrated that malnutrition was significantly associated (all $P < .05$) with postoperative transfusion (odds ratio, 2.49), extended LOS (odds ratio, 1.69), and death (odds ratio, 18.09).

Conclusion: The overall prevalence of malnutrition was 7.6%. Malnourished patients were at a significantly increased risk for blood transfusion, longer hospital LOS, and death within 30 days of surgery. 75% > 65 years old

**Explanation**: In the statistical analysis of *observational data*, propensity score matching (PSM) is *a statistical matching technique* that attempts to estimate the effect of a treatment, policy, or other intervention by *accounting for the covariates* that predict receiving the treatment

Ageing Research Reviews

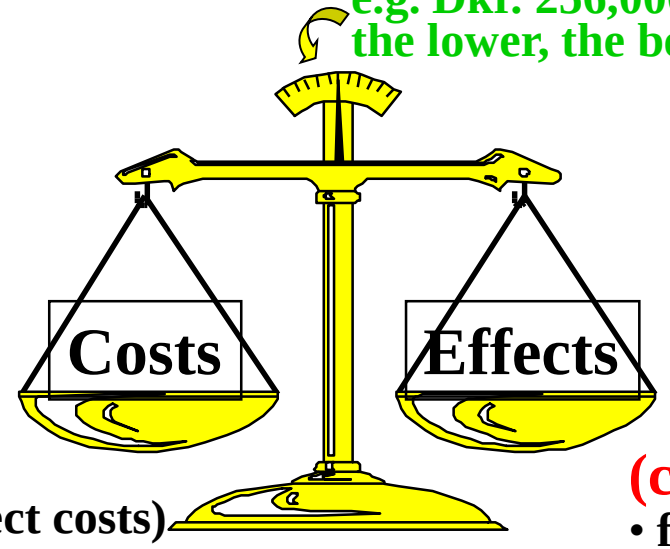
journal homepage: www.elsevier.com/locate/arr

Review

# A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions

# Cost-effectiveness og cost-utility analyses

**Cost-effectiveness fraction,**
**e.g. Dkr. 256,000 per QALY, or per clinical effect unit**
**the lower, the better**




$$ICER = \frac{Cost(A)}{Effects(A)} \quad \frac{Cost(B)}{Effects(B)} = \frac{\Delta Cost)}{\Delta Effects}$$

## COSTS

- Treatment costs (direct costs)
  - no matter who pays
    - societal perspective
- Resources saved

- (normally) not changes in indirect costs
  - sicke leave/disability/premature death

- Ideally data (volume/quantity) collected as an integrated part of the clinical trial
- Unit costs should ideally be marginal, not
  - average costs (’charges’ are of dubious value)

## (clinical) EFFECTS

- from clinical trial/meta analyses

- ’natural units’, e.g. BMI, body weight
- depends on clinically accepted end points
- Quality adjusted life years, QALY
  - then the analysis becomes a cost-utility analysis
  - be careful to chech where quality weights come from and how they are estimated

# The simple logic of cost-effectiveness analysis. Comparison of two alternatives, A and B – e.g. ONS vs. usual care

| | **Health effects: comparison of A and B (using one endpoint-dimension)** | | | |
|---|---|---|---|---|
| **Costs: Comparison of (direct) costs of A and B** | | ***A* > *B*** | ***A* = *B*** | ***A* < *B*** |
| | ***A* < *B*** | | | |
| | ***A* = *B*** | | | |
| | ***A* > *B*** | | | |

**”Effectiveness of nutritional interventions in older adults at risk of malnutrition across different health care settings: Pooled analyses of** *individual participant data from nine randomized controlled trials”, Clinical Nutrition 38, 2019*

**Conclusions**: Based on pooled data of older adults (at risk of malnutrition), nutritional interventions have a positive effect on energy intake and body weight. *Dietary counseling combined with ONS is the most effective intervention*.

**”Effectiveness of multidisciplinary nutritional support in older hospitalised patients: A systematic review and meta-analyses”,** *Clinical Nutrition ESPEN 27 (2018) 44**e**52*

”Although a small number of studies and a relatively small sample size, a suggestion is that provision of multidisciplinary nutritional support may have a positive effect on mortality and improves quality of life in older patients”

# Careful costing, Dutch RCT study 2011

Health care utilization of patients to the intervention or control group in three months after discharge.

| Type of utilization | Intervention group ($n = 75$) | Control group ($n = 68$) | Difference (CI 95%) | Costs (€) 2008 |
|---|---|---|---|---|
| **Direct health care costs** | | | | |
| Medical specialist [no. visits] | | | | |
| Hospital admission ICU included [no. days] | | | | |
| Hospital daycare admission [no. days] | | | | |
| Blood test [no. tests] | | | | |
| Diagnostic research [no. tests] [a] | | | | |
| General practitioner [no. consultations] | | | | |
| Paramedic [no visits][b] | | | | |
| Rehabilitation centre [no. days] | | | | |
| Nursing home [no. days] | | | | |
| Residential home [no. days] | | | | |
| Hospice [no. days] | | | | |
| Pharmacy medication [no. doctor's prescriptions] | | | | |
| Professional household home care [no. hours] | | | | |
| Professional physical home care [no. hours] | | | | |
| **Direct non-health care costs** | | | | |
| Complementary medicine [no. visits][c] | | | | |
| Informal care [no. hours] | | | | |
| **Indirect costs** | | | | |
| Absenteeism paid labour [no. days] | | | | |
| Absenteeism unpaid labour [no. days] | | | | |

# German economic evaluation (reasonable quality)

| | *High-price scenario* | *Low-price scenario* |
|---|---|---|
| *Costs (Euro)* | | |
| Intervention | 561.42 (513.77–609.08) | 440.71 (403.30–478.12) |
| Control | 21.56 (0–72.70) | 16.89 (0–57.07) |
| Difference | 540.16 (468.39–611.94) | 424.02 (367.68–480.36) |
| *P*-value | ⩽0.001 | ⩽0.001 |
| *Utilties* | | |
| *Baseline* | | |
| Intervention | 0.594 (0.556–0.632) | |
| Control | 0.619 (0.579–0.659) | |
| *P*-value | n.s. | |
| *At 3 months after study onset* | | |
| Intervention | 0.731 (0.698–0.764) | |
| Control | 0.671 ( 0.635–0.706) | |
| *P*-value | 0.022 | |
| *Quality-adjusted life years* | | |
| Intervention | 0.659 (0.643–0.676) | |
| Control | 0.615 (0.597–0.633) | |
| Difference | 0.045 (QALYs gained for intervention) | |
| *P*-value | 0.003 | |
| *ICER (costs to reach one QALY gained due to the intervention) (Euro)* | 12 099 | 9497 |

Abbreviations: ICER, incremental cost effectiveness ratio; QALYs, quality-adjusted life years.
Values are portrayed as mean and 95% confidence interval.

# The impact of malnutrition on healthcare costs and economic considerations for the use of oral nutritional supplements

UK
65 years+
Written for NICE

**Table 1** Estimated annual public health expenditure on individuals at medium and high risk of malnutrition.

| | Actual cost (£ million) | Additional cost* (£ million) |
|---|---|---|
| Hospital inpatients (Model 2b) | 3796 | 3194 |
| Long-term care | 2600 | 1646 |
| GP visits† | >494 | >194 |
| Hospital outpatient visits† | >175 | >43 |
| Artificial nutrition and ONS in hospital | 54 | 54 |
| Artificial nutrition and ONS in the community | 149+ | 149+ |
| Other | ? | ? |
| Total | >7268 | >5280 |

*Extra annual cost for treating community patients with medium and high risk of malnutrition compared to the same number with low risk of malnutrition. It is assumed that medium+high risk of malnutrition was present in 10% of community patients over 65 years and 2.5% in those aged <65 years. The additional value for hospital care assumes that 35% of inpatients over 65 years and 25% of inpatients <65 years have medium and high risk of malnutrition.